SECTION IX

SECURITY

9.1. All Classified Information provided pursuant to this MIEM will be used, stored, handled, transmitted, and safeguarded in accordance with the Participant's national security laws and regulations, to the extent that they provide a degree of protection no less stringent than that provided for NATO Classified Information as set forth in the document 'Security Within the North Atlantic Treaty Organization' C-M (2002) 49 dated 17 June 2002 and its subsequent amendments.

9.2. Information provided in accordance with this MIEM may be classified up to NATO Confidential. This MIEM and its contents are Unclassified.

SECTION X

THIRD PARTY TRANSFERS

10.1. The Participants will not sell, transfer title to, disclose, or transfer possession of Electric Warship Information received under this MIEM, or any item produced either wholly or in part from Electric Warship Information received under this MIEM, to any Third Party without the prior written consent of the Participant's Government that provided that information under the MIEM. The providing Participant's Government will be solely responsible for authorizing such transfers and specifying the methods, conditions, and provisions for implementing such transfers.

SECTION XI

SETTLEMENT OF DISPUTES

11.1. Disputes between the Participants arising under or relating to this MIEM will be resolved only by consultation between the Participants and will not be referred to a national court, an international tribunal, or to any other person or entity for settlement.

SECTION XII

AMENDMENT, TERMINATION, ENTRY INTO EFFECT, AND DURATION

12.1. This MIEM may be amended upon the written consent of the Participants. Authorities may change TPO assignments, and TPOs may change the list of Establishments, through an exchange of correspondence. Annex A (Electric Warship Information) and Annex B (List of Establishments) may be amended by written approval of the TPOs.

12.2. This MIEM may be terminated at any time by the written consent of the Participants. In the event the Participants decide to terminate the MIEM they will consult at the appropriate level prior to the date of its termination to ensure termination on the most equitable terms.

12.3. In the event that a Participant finds it necessary to unilaterally terminate its participation in the MIEM, such termination will be subject to the provisions of this MIEM. Upon receipt of written notice of a Participant's intent to terminate its participation in the MIEM, the Authorities will determine the appropriate course of action.

12.3.1. A Participant may terminate its participation in this MIEM upon 90 days written notification to the other Participants.

12.3.2. The terminating Participant will continue participation until the effective date of termination.

12.4. The respective rights and responsibilities of the Participants regarding Section VII (Disclosure and Use of Electric Warship Information), Section VIII (Controlled Unclassified Information), Section IX (Security), Section X (Third Party Transfers) and this Section XII (Amendment, Termination, Entry Into Effect, and Duration) will continue notwithstanding termination or expiration of this MIEM.

12.5. This MIEM, which consists of the Introduction, twelve Sections, and two Annexes will enter into effect upon signature by all the Participants and will remain in effect for fifteen years. The Participants will consult no later than two years prior to the expiration of this MIEM and decide whether or not to extend its duration, by amendment. It may then be extended by written consent of the Participants.

The foregoing represents the understandings reached between the Participants upon the matters referred to therein.

Signed in three original copies in both the English and French languages, each text being equally valid.

For the Minister of Defence of the French Republic

Signature

François Lureau
Name

Délégué général pour l'armement
Title

30 AVR. 2004
Date

Paris, France
Location

For the Secretary of State for Defence of the United Kingdom of Great Britain and Northern Ireland

Signature

A.R. ASHTON
Name

Future Business Group - Group Leader
Title

6 MAY 2004
Date

Bristol, UK
Location

For the Secretary of Defense on behalf of the Department of Defense of the United States of America

Signature

M. R. MILLIKEN, RDML, USN
Name

Deputy Assistant Secretary of the Navy (International Programs)
Title

07 April 2004
Date

Washington, DC
Location

ANNEX A

ELECTRIC WARSHIP INFORMATION

INTRODUCTION

This Annex details the technology breakdown for future Electric Warships, and the subjects for discussion for each of the technologies listed. A definition of Electric Warship is also given, with its evolution from the initial hybrid plants.

DEFINITIONS

Hybrid – Combination of mechanical and electric drive, sometime called partial electric drive.
IEP – Hybrid + common power source is utilized for both ship services and propulsion system, with propulsion being purely electric.
IFEP – IEP + incorporates advanced power electronics and energy storage into the architecture to give further cost and operational benefits.
Electric Ship – IFEP + incorporates advanced prime movers and widespread electrification of auxiliaries into the IFEP architecture.
Electric Warship – Electric Ship + novel high power weapons and sensors are incorporated to take advantage of the high system powers available.

TECHNOLOGY BREAKDOWN

System	Sub-system	Enabling Technology
HV Propulsion System	Propulsion Motors	Standard Induction
		Converter Fed Induction
		Advanced Poly-phase Induction
		Wound Field Synchronous
		Advanced Poly-phase Synchronous
		Brushed DC
		Superconducting DC Homopolar
		Novel (ie: Switched Reluctance)
		Axial Flux PMPM
		Radial Flux PMPM
		Transverse Flux PMPM
	Propulsion Converters	PWM With 6 Pulse Diode Front End
		PWM With 12 Pulse Diode Front End
		PWM With Thyristor Front End
		PWM With Active IGBT Front End
		Current Source Converter
		DC
		Cycloconverter
		Voltage Source Converter
		Novel Topology
	Propulsor	Conventional – Fixed Pitch Propeller
		Conventional – Controllable Pitch Propeller
		Pods
		Novel

HV Generation	Prime Mover	Simple Cycle GTAs (Small)
		Simple Cycle GTAs (Medium)
		Simple Cycle GTAs (Large)
		Advanced Cycle GTAs (Small)
		Advanced Cycle GTAs (Medium)
		Advanced Cycle GTAs (Large)
		DGs
		Standard Turbo-Alternators
		Advanced Turbo-Alternators
		AIP
	Generators	Induction Generator
		Wound Field Synchronous
		PM Generator
		Brushed DC
	Generators – Other	Fuel Cells – DC

HV Power Distribution	HV Switchgear	Hybrid
		Conventional – Vacuum
		Conventional – SF6
		Conventional – Air Circuit Breaker
		Embedded with Converter
		Solid State
	HV Switchboard	Arc proof (to IEC60298)
		Non-Arc Proof
	HV-LV Conversion	Transformer
		Rotary
		Single Direction Static
		Bi-directional Static
	Filter	Active
		Passive
		Hybrid
	Cabling	EPR
		XLPE
		Busbar
	Protection	Conventional Relays
		Integral with Platform Management System
	HV Starters/Control	VSDs
		Conventional Starters
		Soft Starters

HV Consumers / Loads	EM Catapult	Inverters
		Linear Induction Motors
		Linear Synchronous Motors
		Energy Storage
	High Power Sensors	Inverters
		Pulse Forming Networks
		Energy Storage
	High Power Weapons	Inverters
		Pulse Forming Networks
		Energy Storage
	Actuation	

Energy Storage	Bulk Storage	Batteries
		Capacitors (Conventional/Super)
		Mechanical (flywheels)
		Redox Flow Cell
	UPS	Batteries
		Capacitors (Conventional/Super)
		Mechanical (flywheels)
		Redox Flow Cell

LV Power Generation	Prime Mover	Simple Cycle GTAs (Small)
		Simple Cycle GTAs (Medium)
		Simple Cycle GTAs (Large)
		Advanced Cycle GTAs (Small)
		Advanced Cycle GTAs (Medium)
		Advanced Cycle GTAs (Large)
		DGs
		Standard Turbo-Alternators
		Advanced Turbo-Alternators
		AIP
	Generators	Induction Generator
		Wound Field Synchronous
		PM Generator
		Brushed DC
	Generation – other	Fuel Cells – DC

LV Power Distribution	LV Switchgear	Hybrid
		Conventional
		Embedded with Converter
		Novel
	LV Distribution	EDCs + CSDCs + SFCs
		EDCs + UPSs
		ZPSUs + ZESUs
	Filter	Active
		Passive
		Hybrid
	Cabling	EPR
		XLPE
		Flexible
		Busbar Trunking
	LV Starters/Control	VSDs
		Conventional Starters
		Intelligent Starters (Conventional)
		Soft Starters
	Actuation	

Automation	Power Management	Discrete Components
		Stand Alone System
		Integrated with Platform Management System

DISCUSSION TOPICS

Platform Issues	Installation
	Hull & Structure
	Noise & Vibration
	Signatures
	Naval Shock requirements
	Platform Survivability
	Operational capability (eg:, range, endurance, speed, response)
System Characteristics	AC systems
	DC Systems
	Quality of Power Supply (AC & DC)
	EMC (AC & DC)
System Issues	System Integration
	System Performance
	System Operability
	Flexibility
	Reversionary Modes
	Infrastructure
	Auxiliary Support Equipment
Support	Emissions
	Health & Safety
	Human Factors Integration
	Availability, Reliability & Maintainability
	Integrated Logistic Support
	Training
Costs	Development Costs
	Unit Production Costs
	Whole Life Costs
Timescales	Development Timescales
	Production Timescales

ANNEX B

LIST OF ESTABLISHMENTS

Establishments for this MIEM are:

UK Participants:

MoD Abbey Wood
Filton Bristol BS34 8JH

MoD Foxhill
Bradford Road
Combe Down
Bath

HM Naval Base Portsmouth
Portsmouth

HM Naval Base Devonport
Plymouth

FR Participants:

DGA/SPN/ST
8 boulevard Victor
00303 ARMÉES

DGA/DCE/CTSN
BP 28
83800 TOULON NAVAL

DGA/DCE/GESMA
BP 42
29240 BREST NAVAL

US Participants:

Naval Sea Systems Command
1333 Isaac Hull Avenue S. E.
Washington Navy Yard, D.C. 20376

Office of Naval Research
800 N. Quincy St.,
Arlington, VA 22217-5660

Carderock Division,
Naval Surface Warfare Center
9500 MacArthur Boulevard
West Bethesda, MD 20817-5700

Ship Systems Engineering Station
Carderock Division, Naval Surface Warfare Center
Philadelphia Naval Business Center
5001 South Broad St.
Philadelphia, PA 19112-1403

Crane Division
Naval Surface Warfare Center
300 Highway 361
Crane IN 47522-5001